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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

BERNSHTEYN, MICHAEL

ART UNIT	PAPER NUMBER
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1713

DATE MAILED: 11/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/523,373	Applicant(s) KIEFER ET AL.	
	Examiner Michael Bernshteyn	Art Unit 1713	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 25-50 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 25-50 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☒ Claim(s) 25-50 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>02/02/2005</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

1. Claims 25, 44, 48 and 50 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. It is not clear how practically to obtain the polymerization of the vinyl-containing sulfonic acid present in the sheetlike structure because after the mixture was heated under inert gas to temperatures of up to 350C to form polyazole polymers, there is no more the vinyl-containing sulfonic acid in the mixture for the polymerization. The specification does not show the sequence of steps of the claimed processes.

Therefore, it appears that it would not enable one skilled in the art to which it pertain, or with which it is mostly connected, to make and/or use the invention.

Appropriate correction is required.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 25, 44, 48 and 50 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 25, 44, 48 and 50 recite the limitation " obtainable". There is insufficient antecedent basis for this limitation in the claims.

The claim is indefinite if undue experimentation is involved to determine boundaries of protection. This rationale is applicable to polymer "obtainable" by a stated process because any variation in any parameter within the scope of the claimed process would change the polymer produced. One who made or used a polymer made by a process other than the process cited in the claim would have to produce a polymer using all possible parameters within the scope of the claim, and then extensively analyze each product to determine if this polymer was obtainable by a process within the scope of the claimed process. See *Ex parte Tanksley*, 26 USPQ 2d 1389.

Appropriate correction is required.

3. Claim 39 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "substance" used in the above claim is a relative claim, which renders the claim indefinite. The term "substance" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not reasonably appraised of the scope of invention.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

1. Claims 25-50 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative under 103(a) as obvious over Muller et al. (DE 101 33 739.8). The US Patent Application Publication 2004/0186189 is equivalent to the DE 101 33 739.8, therefore the following rejection is based upon the context of 2004/0186189.

With regard to the limitation of instant claims 25 (steps a, b, c), 34, 36, 44, 48 and 50, Muller discloses a process for producing **polymer electrolyte membranes** (page 1, [0001]). The use of monomers which lead to incorporation of ion-conducting groups (**sulfonic acid**, phosphonic acid or **carboxylic acid groups**) in this process makes it possible to produce ion-conducting **polymer membranes** which, due to their stability and their barrier action in respect of gas or liquid permeation as a result of the higher degree of crosslinking, are suitable for use in fuel cells, in particular direct methanol fuel cells, or electrolysis cells. In addition, the deposition technology used makes it possible to produce **thin membranes**, which are of interest for, in particular, use in miniaturized fuel cell systems for portable applications or as barrier layers deposited on conventional membranes e.g. polybenzimidazole membranes doped with phosphoric acid or **membranes containing sulfonic acid groups** (page 1, [0002]).

Muller discloses that due to the excellent properties of polyazole polymers, such polymer electrolyte membranes can, when converting into membrane-electrode units (MEUs), be used in fuel cells at long-term operating temperatures above 100°C, in particular above 120°C (page 1, [0009]). Use of polymer electrolyte membranes based

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on **polyazole** polymers makes it possible, firstly, to omit the complicated gas work-up or gas purification, at least in part, and secondly, to reduce the amount of catalyst present in the membrane-electrode unit (page 1, [0010]).

Muller discloses that the preparation of such polyazole is known. In the known method, one or more tetraamino compounds is/are reacted with one or more aromatic carboxylic acids or esters thereof which contain at least two acid groups per carboxylic acid monomer to form a prepolymer. The prepolymer formed solidifies in the reactor and is subsequently comminuted mechanically. The prepolymer is usually polymerized fully in a solid-state polymerization at temperatures up to 400⁰C (page 5, [0042]).

Muller discloses a process comprising the steps: A) mixing of one or more aromatic tetraamino compounds with one or more aromatic carboxylic acids or esters thereof contain at least two acid groups per carboxylic acid monomer, or mixing of one or more aromatic and/or heteroaromatic diaminocarboxylic acids, in polyphosphoric acid to form a solution and/or dispersion; B) application of a layer to support or to an electrode using the mixture from step A); C) heating the flat structure/layer obtainable by the method of step B) to temperatures of up 350⁰C under inert gas to form the polyazole polymer; D) treatment of the membrane formed in step C (until it self-supporting) (page 7, [0072] - [0076]).

With regard to the limitation of instant claim 25 (step d), Muller does disclose polymerizing vinyl-containing sulfonic acid present in the sheetlike structure obtainable according step c). He discloses that the treatment of the membrane in step D) is carried out at temperatures above 0⁰C and less than 150⁰C in the presence of moisture or

water and/or water vapor. The treatment is preferably carried out under superatmospheric pressure (page 7, [0084]). The membrane obtained as per step D) can be made self-supporting, i.e. can be detached from the support without damage and subsequently be directed process further, if desired (page 8, [0091]). Subsequent to the treatment as per step D), the membrane can be crosslinked further on the surface by action of heat in the presence of atmospheric oxygen. This hardening of the membrane surface effects an additional improvement in the properties of the membrane (page 8, [0093]). The crosslinking also can be carried out by action of IR or NIR, a further method is irradiation with β -rays. The radiation dose is in this case in the range from 5 to 200 kGy (page 8, [0094]).

According to the specification, the polymerization of the vinyl-containing sulfonic acid and, where present, vinyl-containing phosphonic acid in step D) may take place by exposure to IR or NIR, or to β , γ and/or electron beam (page 32, lines 16, 30), and a membrane is irradiated with a radiation dose is in this case in the range from 1 to 300 kGy (page 32, line 31), the polymerization takes place preferably at temperatures above room temperature (20°C) and less than 200°C under atmospheric pressure, but also can take place with exposure to superatmospheric pressure. The polymerization leads to solidification of the sheetlike structure, and this solidification can be monitored by measuring microhardness (page 32, line 34 through page 33, line 3). Depending on the desired degree of polymerization the sheetlike structure is a self-supporting membrane (page 33, lines 22-23 and page 34, lines 5-7). The membrane can be crosslinked at the

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surface and this curing of the membrane surface further improves the properties of the membrane (page 34, lines 8-11).

Therefore, the limitation of the step D) of the process in Application is substantially identical to US'189.

Regarding the proton-conducting polymer membrane limitations in view of substantially identical monomers (sulfonic or phosphonic acids, aromatic tetraamino compounds, aromatic carboxylic acids, a aromatic or heteroaromatic diaminocarboxylic acids, etc.), mixing the above monomers and heating the mixture under inert gas to temperatures of up to 350°C, applying a layer to support (compare US'189, page 7, [0067] - [0076], and the specification, pages 18-20) being used by both Muller and the applicant, it is the examiner position to believe that the product, i.e. polyazole membrane of Muller is substantially the same as the proton-conducting polymer membrane recited in claim 25, even though obtained by a different process, consult *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

Since the USPTO does not have proper equipment to do the analytical test, the burden is now shifted to the applicant to prove otherwise.

With regard to the limitation of instant claim 26, Muller discloses that preferred aromatic tetraamino compounds include **3,3',4,4'-tetraaminobiphenyl**, **2,3,5,6-tetraaminopyridine**, **1,2,4,5-tetraaminobenzene**, etc. (page 6, [0052]).

With regard to the limitation of instant claim 27, Muller discloses that preferred aromatic carboxylic acids include dicarboxylic acids and tricarboxylic acids and tetracarboxylic acids and their esters or their anhydrides or their acid chlorides. The

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term aromatic carboxylic acids also encompasses heteroaromatic carboxylic acids (page 5, [0043]).

With regard to the limitation of instant claim 28 and 29, Muller discloses that the aromatic tricarboxylic acids or tetracarboxylic acids and their C1-C20-alkyl esters or C5-C12-aryl esters or acid anhydrides or acid chlorides are preferably **1,3,5-benzenetricarboxylic acid (trimesic acid), 1,2,4-benzenetricarboxylic acid (trimellitic acid), (2-carboxyphenyl) iminodiacetic acid, 3,5,3'-biphenyltricarboxylic acid, 3,5,4'--biphenyltricarboxylic acid** (page 6, [0045]).

With regard to the limitation of instant claim 30, Muller discloses that the content of tricarboxylic acids or tetracarboxylic acids (based on dicarboxylic acid used) is in the range from **0 to 30 mol%** (page 6, [0048]).

With regard to the limitation of instant claim 31 and 32, Muller discloses that the heteroaromatic carboxylic acids used are preferably heteroaromatic dicarboxylic acids and tricarboxylic acids and tetracarboxylic acids or their esters or anhydrides, such as **pyridine-2,5-dicarboxylic acid, pyridine-3,5-dicarboxylic acid, pyridine-2,6-dicarboxylic acid**, etc., and also their C1-C20-alkyl esters or C5-C12-aryl esters or their acid anhydrides or their acid chlorides (page 6, [0047]).

With regard to the limitation of instant claim 33, Muller discloses that the aromatic and heteroaromatic diaminocarboxylic acids used are preferably **diaminobenzoic acid** and its **monohydrochloride and dihydrochloride derivatives** (page 6, [0049]).

With regard to the limitation of instant claims 35 and 37, Muller discloses that the mixture produced in step A) has a weight ration of polyphosphoric acid to the sum of all

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monomers from 1:10,000 to 10,000:1, preferably from 1:1,000 to 1,000:1, in particular from 1:100 to 100:1 (page 7, [0078]).

With regard to the limitation of instant claim 41, Muller discloses that to produce polymer films, the polyazole is, in further step, dissolved in polar solvents, such as dimethylacetamide (page 6, [0055]).

With regard to the limitation of instant claims 42 and 43, Muller discloses that the layer formation is carried out by methods, which are known per se from the field of polymer film production (casting, spraying, doctor blade coating). As supports, it is possible to use all supports, which are inert under the conditions in question. The produced layer has a thickness of from 20 to 4000 μm , preferably from 30 to 3500 μm , in particular from 50 to 3000 μm (page 7, [0079] and [0080]).

With regard to the limitation of instant claims 45 and 46, Muller does not disclose the thickness of the electrode coating.

It is noted that the thickness of the electrode coating is a result effective variable, and therefore, it is within the skill of those skilled in the art to find the optimum value of a result effective variable, as per *In re Boesch and Slaney* 205 USPQ 215 (CCPA 1980): Discovery of optimum value of a result effective variable in known process is ordinarily within the skill in the art and would have been obvious.

With regard to the limitation of instant claim 47, Muller discloses that a membrane-electrode unit comprising at least one polyazole-based polymer membrane (page 10, [0141]).

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With regard to the limitation of instant claim 49, Muller discloses that the membrane-electrode unit comprising at least one polymer membrane, if desired in combination with a further polymer membrane based on polyazoles (page 11, [0144]).

Thus, Muller renders instant claims *prima facie* obvious in view of absent of unexpected results commensurate in scope of claims.

Conclusion

Other references used but not cited in this office action include U.S. Patents 3,313,783, 5,525,436, 4,075,093, 6,803,139, 6,607,856, US 2004/01186189, US 2005/0244695, US 2004/0191602 and US-2005/0244694 are shown on the Notice of References Cited Form (PTO-892).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Bernshteyn whose telephone number is 571-272-2411. The examiner can normally be reached on M-F 8-5:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Michael Bernshetyn
Patent Examiner
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11/09/2005


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